2:Underhill E-5 (1931-1935)1939 NU28 Papago NU28
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Colorado, other food gatherers, the Southern California Shoshoneans, extended it almost to the sea. But, between the Pimans and these congeners of simpler culture, was thrust a wedge of another stock, the Yuman, occupying the Colorado River valley and its adjacent highlands so as effectually to separate the southern agriculturists from the northern and western food gatherers. Pa Pi 174

Pimans thus found themselves at the meeting point of several areas, both cultural and geographic and, because of their situation in open desert country, they were in easy communication with all. Well worn routes led to the south where they traded with their more prosperous linguistic relatives. To the west, a few days journey over identical desert country brought them to the River Yumans, whose living conditions were so similar that the equipment of the two peoples often coincides, point for point. To the northwest, open Basin and Range country continued into the great stretches occupied by their Shoshonean kin.

Travel was more difficult to the northeast, where the Pueblos stood on the high plateau that marks the change from torrid to temperate country. At least in historic times, the intervening rough country was held by Apache, enemies of the Pimans. Yet, in prehistoric times, it was down over the Mogollon Rim that Pueblo immigrants filtered into the Gila and it is with the Hopi, above the Rim, that the Papago show some of their most obvious likenesses.

It was only at the east that communication stopped. There, in historic times, lived the Apache, whom the Pimans met only in war skirmishes and from whose country they brought not a shred of booty to spread its evil magic. Pimans owe nothing to the Athapascans except the constant stimulus derived from two centuries of warfare and any likenesses between the two peoples must be traced to a common source in the Pueblos. Pa

The country of the Pimans themselves is a southern extension of the Basin and Range area which has been roughly described as a desert parallelogram, outlined by streams. It was the Pima, the River People, who occupied the stream valleys, while the Papago, the Desert People, made the best of the arid interior. Their land was a succession of flat valleys, floored with wind blown pebbles and interrupted by low mountain ridges, water and wind eroded into gullies and pinnacles. The ridges are never continuous and a wandering people could thread its way to and fro over the whole desert without encountering any obstacle but thirst. On the lower slopes grow giant cactus, cholla and prickly pear, widely spaced so that each may have its share of water and with their succulent stems veiled from the blinding light by forests of white thorns. Along the dry Pa Pi 133 Pa Pi 137

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Pa Pi 137 stream beds the bean bearing mesquite and palo verde stretch their roots down to underground water. On the plain grows the creosote bush and sometimes nothing else.

Pa Pi 132 This is one of the hottest and driest areas in the United States, the annual rainfall in the interior being about five inches.[1] Yet those five inches rendered subsistence possible for the Desert People. They are concentrated in the summer months of July and August when the daily cloudburst produces a temporary flood which may cover the flat plain to a depth of six inches for a square mile. In a day or two there sprout the seeds of annuals which may have remained inactive for several seasons, awaiting sufficient moisture. The succulent cacti swell, storing water for the dry months. The deciduous trees put out tiny leaves, exposing to the glare as little green as possible.

Pa 221 For two months while the desert bloomed, the Papago picked and stored every root, stalk, leaf and fruit that it produced. Where the flood water had softened the soil, they planted small gardens which, begun in mid-July, had just time to mature before frost. All the harvest was dehydrated in the blazing desert sun and stored to furnish food in the dry months. Then the rain ceased; the rain reservoirs which had supplied drinking water for the valley dwellers dried up; life was impossible unless the population moved to the foothills where there were springs.

Pa [657] Until very recently, when the United States government has dug wells in the valleys, this was the life of the Papago. It precluded their having permanent houses, either for dwellings or for ceremonies. It prevented a centralized form of organization such as has been suggested for the Pima, both on the Gila and the San Pedro. But it kept the Papago unmolested until long after these others had disappeared or had assimilated White ways.

Pa 174 Yet the Desert People, harassed by Nature as they were, found opportunity to practise all the arts described for the more fortunate Pima,[2] with only minor differences, due to materials. We may picture them, up to a few generations ago, living in round, semi-subterranean houses, often earth covered. They dressed in skirts and breechclouts of buckskin and, less often, cotton and wore sandals when they had any footgear at all. Their pottery was of coarse red clay, shaped by paddle and anvil with, only rarely, a decorated jar for offerings and seed storage. The bulk of their utensils was of basketry: plaited, coiled or netted in the intricate technique known as coil without foundation. These are old arts in

[1] Bryan, pp. 29—30.
[2] Russell, pp. 68—181. Castetter and Underhill, pp. 48—63.

4: Joseph et al D, E-5 (1942-1943) 1949
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Baboquivari Peak, Center of the Papago Universe

[Facing p. iii]

4: Joseph et al D, E-5 (1942-1943) 1949
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but the summer storms come suddenly, the clouds pouring out water and then disappearing as quickly as they came. Rainfall varies greatly on different parts of the Reservation. In the southeastern districts where the mountains are highest, annual precipitation reaches an average of 18 inches in the mountains and about 13 inches in the valleys. Most of the permanent springs and the few small streams that flow for nine months in wet years are located in the foothills of this area. From the center of the Reservation westward, rainfall decreases progressively, averaging only 5 inches in Gu Vo District. Averages give no realistic picture, however, for years of good rainfall are often followed by years in which the washes do not flow at all. The year 1943, when the field work for this study was done, was one of extreme drought, perhaps the worst in history. 132

Temperature also fluctuates greatly. Winters are mild, with many sunny days, but sometimes the winds are raw and cold, and at night the thermometer may fall to 15° Fahrenheit. Sometimes snow falls on the higher mountains and may remain several days. The summer, from May through September, is extremely hot, with daytime temperatures usually exceeding 100° and often soaring to 120°. Daily range of temperature is wide; the average daily maximum and minimum are 82.5° and 51.1°—an average daily change of 31.4°.

Soils on the Reservation are generally of very good quality; lack of water is the prime factor limiting production. Hence the more arid western districts have a much lower proportion of farm lands and lower range carrying capacity than the central and eastern districts. 134

Like rainfall, vegetation varies with elevation. On the valley floors are miles and miles of cholla cactus and almost useless creosote bush,[5] and along the washes the sturdy and useful mesquite thrives. In the eastern districts mesquite is the characteristic growth; in the western areas the creosote bush, and in some alkaline regions the saltbush, are the most common plants. Even the mesquite areas are not so useful for range lands as they once were. Until about 1900, these areas were largely covered with perennial bunch grasses which provided good forage and helped to retain the topsoil. With increasing numbers of livestock, these grasses disappeared and the common grasses now are annuals which for forage must be supplemented by mesquite, cholla, saltbush, bur sage, and paloverde. Loss of the perennial grasses has also permitted considerable soil erosion, although there is little gullying because the valleys are flat. 137

Where the valleys rise to the foothills, and continuing over most of the low ranges, paloverde, ironwood, and giant saguaro cactus are the main stands.

5. The creosote bush does furnish fuel, a gum with which the Papago mend pottery, and it has some medicinal uses. But animals will eat it only in an emergency. [32.3] [31.4]

4: Joseph et al D, E-5 (1942-1943) 1949
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137 On the foothills of the higher mountains is a shrub growth which includes false mesquite, yucca, bear grass, and grama grass, the latter excellent for forage, while on the summits of the Baboquivari Mountains are found oak and scrub pine. There are thousands of other varieties, some useful, some not; but those named constitute the principal plants in Papaguería.

Not much large wildlife is left now, though there are a few deer, peccary, 136 and wildcat, and, infrequently, a bear or wolf in the mountains. However, myriads of coyotes, rabbits, gophers, pack rats, and many varieties of birds thrive over the whole region. One keeps a wary eye, too, for rattlesnakes.

After the rains of winter during which much of the vegetation has stood 137 without sign of life, the desert bursts into bloom. The ocotillo thrusts shoots of red fire from the ends of its long spindly arms, the ironwood sheds a purple haze over hillsides, meadows spring into a riot of color—orange, blue, purple, white. Thorny mesquite and paloverde become clouds of bright yellow, turning into delicate green as the tiny leaves appear. Not so striking in panoramic view but equally beautiful are the perfect waxlike flowers of the various cacti. As spring draws into summer, the bright colors fade into shades of green and brown and gray, overlaid by a film of tan dust, and in the late fall the deciduous trees lose their leaves. On the whole, the greatest change in color comes with the spring, but there is also the daily change of light and shadow: the brilliant sun and the glowering thunderheads, the blue and purple hazes over the mountains, the fleecy white clouds and the deep sky—the sky which seems so much vaster over the desert than anywhere else.

Papaguería, then, is a desert because it is arid, but it is far from being a sandy waste. Its tremendous variety of vegetation is widely distributed to give all a share of what little moisture is available. The desert plants are like the human inhabitants of this area in their adaptation to and use of the land.

4: Joseph et al D, E-5 (1942-1943) 1949
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PLATE III

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Raymond B. Spicer

a) End of a drought

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Raymond B. Spicer

b) Cattle drinking in a shower

WATER MEANS LIFE

[p.32]

4: Joseph et al D, E-5 (1942-1943) 1949
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PLATE IX

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Jane Cleeby

a) Picking the fruit from the giant saguaro

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Jane Cleeby

b) The fruit goes into an olla for cooking

At the Cactus Camp

[p. 75]

5: Castetter & Bell N-5 (1938-1940) 1942
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greater in amount than the winter rains, but as one went westward they tended to become more nearly equal until, in extreme southwestern Arizona, the winter rains were heavier. He refers to unpublished data of Sykes, who found that analyses of the 118 stations in Arizona show that in most sections the winter rains are greater, and that only in southeastern and southcentral Arizona and two relatively small areas in eastcentral and northeastern Arizona do the summer rains exceed winter precipitation.

Data on the total annual rainfall at any given position constitute a basic starting point for a consideration of the climate of that region. However, knowledge of the distribution, involving fluctuation in rate and amount, is more important from the standpoint of natural vegetation and agriculture than is the yearly total. The wide variation in amount and temporal distribution of rainfall, with their periods of drought and series of dry years, render the Papago country a precarious place to pursue agriculture.

Vegetation[19]

In considering the natural vegetation of the American portion of the Pimería Alta it is desirable to begin with the watercourses that drain the southern desert; one may say that wherever deep alluvial soils have been built up and subterranean water is available, dense forests of mesquite formerly were, and to some extent still are, to be found. Such dense forests occurred on the bottomlands of the San Pedro, the flood plain of the Santa Cruz, lower and middle Gila roughly from within a few miles of Yuma as far east as the point where the Southern Pacific Railroad crosses the Gila northwest of Vahki, and the lower Colorado. Remnants of these original stands still exist along the San Pedro, notably be-

[19] This account of the vegetation of the area under consideration is based upon Nichol, *The Natural Vegetation of Arizona;* Bryan, *op. cit.;* information secured by correspondence with Dr. Forrest Shreve of the Carnegie Desert Laboratory at Tucson; and our own field observations.

5: Castetter & Bell N-5 (1938-1940 1942
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tween Redington and Cascabel. Today mesquite and saltbush (*Atriplex* and *Dondia*) bottoms characterize the Gila from a few miles east of Yuma to the railroad mentioned, as well as a few spots as one approaches Winkelman on this river. The flood plains of the Gila and upper Santa Cruz (also lower Colorado) support groves of cottonwood (*Populus Fremontii*), and associated with them less numerous black willows (*Salix nigra*) and dense thickets of arrowweed (*Pluchea sericea*). Cottonwood and willow are to be found wherever there is permanent water, as on the Arivaca and Sonoita creeks. Where the river is quite stable or the ground higher, the mesquite and saltbush encroach upon the bottomlands; also scattering areas of such vegetation, some of considerable extent, occur in the *playas* of the Santa Cruz, Santa Rosa and, to a less extent, San Pedro valleys. In the more open stands of mesquite, squawberry (*Lycium* spp.) and saltbush are common, and sparsely intermixed with mesquite in the higher, cooler valleys of the San Pedro and Santa Cruz is the mountain hackberry (*Celtis reticulata*). Along the edges and in the openings of the forests of these two drainages, sacaton grass (*Sporobolus Wrightii*) thrives, and commonly associated shrubs are lotebush (*Zizyphus lycioides*), skunkbush (*Rhus trilobata*), chamiso (*Hymenoclea monogyra*), desert saltbush (*Atriplex polycarpa*) and allthorn (*Koeberlinia spinosa*). Dense forests of mesquite are also to be found in the interior valleys where floods spread out thinly over the flats, and narrow strips follow up the drainage systems which arise in the washes toward the hills and desert mountains and descend to the lower levels of the desert grassland.

Along the lower, warmer watercourses of the Gila and Colorado rivers, screwbean (*Prosopis pubescens*) fringes the upper edges of the mesquite belt, on the Gila extending eastward roughly to its junction with the Salt. In these portions of the two rivers, chamiso is partially replaced by the brittle saltbush (*Atriplex Breweri*) and the burro weed (*Allenrolfea*

5: Castetter & Bell N-5 (1938-1940) 1942
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occidentalis). The exotic salt cedar *(Tamarix gallica)* has become widely established in the saline bottoms, competing with the native arrowweed and broad-leaved broom or seep-willow *(Baccharis glutinosa)*. Bermuda grass *(Cynodon dactylon)*, too, has come in and spread extensively.

Although the vegetation of our immediate Pima area on the middle Gila has changed somewhat within the past sixty to seventy years, its general characteristics are still observable. The bottomlands continue to abound in groves of cottonwood although not so profusely as formerly, with some mixture of black willow, and dense thickets of arrowweed which terminate abruptly at the lower terrace. Mesquite and saltbushes here also occupy the higher and more stable bottomlands. The lower terrace continues to support numerous thickets of mesquite, while on the upper terrace is found a xerophytic vegetation in which saltbushes predominate. In many places in the general vicinity of Sacaton, as around the Casa Grande ruins, where the ground water is between thirty and forty feet below the surface, the land is covered with forests of mesquite.

Along the permanent water courses are to be found also large trees of such species as the leatherleaf ash *(Fraxinus velutina)*, western walnut *(Juglans rupestris)* and the Mexican elder *(Sambucus mexicana)*, particularly in the Santa Cruz and Arivaca valleys. With these is often associated the Arizona sycamore *(Platanus Wrightii)*. This also occurs singly or in small clumps at springs, wells and stream channels along the base of the Baboquivari Mountains, as does the hackberry *(Celtis occidentalis)*, which ranges as well along the foot of the Tumacácori and in the upper Santa Cruz Valley and on Arivaca Creek.

Getting away from the watercourses, there is to be found a vegetation dominated by creosote bush *(Larrea tridentata)* and saltbush. Within the limits of the climatic factors favoring desert growth this association is governed by soil features.

5: Castetter & Bell N-5 (1938-1940 1942
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In Arizona the areas occupied by this type in the main division of the southern desert are in general the more level terrain, the shallow valleys, mesas and the sandy soils between the desert mountain ranges. In the western part of the area, with a rainfall of rarely more than four inches, creosote bush occurs in the better-drained and sandy soil where it can utilize moisture from the winter rains. In the eastern part of the creosote bush range, where precipitation is much higher, pure stands of this plant usually occur on very shallow soil underlaid by caliche, but the species fades out in the extreme southeastern part of the Papago country.

The desert saltbush often is found in almost pure stands, representing a subtype of the creosote-Atriplex type. With it there is sometimes a scattering of *quelite salada (Dondia moquini)*, mesquite, cholla or creosote bush. This type of cover is indicative of deep, fine loam soils, highly desirable for cultivation.

The portions of the southern desert characterized by roughest terrain and highest levels are occupied by the paloverde *(Cercidium microphyllum)*-cacti type of desert. Differences in local conditions cause it to take on various expressions. In the area under consideration it is usually bordered below by the creosote bush-Atriplex association, or now and then by mesquite *bosques*. Higher it is often met by the belt of desert land grass as in much of southern Pima County. The dominant tree in this desert shrub is paloverde. From the lower San Pedro Valley this plant extends westward in the foothill cover of the desert mountains, becoming increasingly sparse, until in the vicinity of Ajo and Gila Bend it well-nigh disappears. Northward in our area it is common in the Gila and Salt drainages. Locally paloverde may give way to other trees or shrubs. Thus dense stands of sahuaro *(Carnegiea gigantea)* may dwarf the woody forest, notably on the foothills of the Santa Catalina, Tanque Verde and Tucson mountains; in the ranges bordering the Santa Rosa Valley

5: Castetter & Bell N-5 (1938-1940) 1942
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on the Sells Papago Reservation; along the international boundary from Nogales west to the Gila Mountains; in the broad desert valleys adjacent to the Gila River and its tributaries as far east as the Coolidge Dam, and in the general vicinity of Tucson. It reaches its best expression between altitudes of two thousand and three thousand feet. Incidentally the related organ-pipe cactus *(Lemaireocereus Thurberi)* occurs in a few places, such as the Growler Mountains, but is most abundant from a line south of Ajo to the Mexican border in the Organ Pipe Cactus National Monument. Its northern limit is the Ajo Valley, and Hornaday[20] observed it from there to the eastern edge of the Pinacate lava fields on the Sonoita River.

Next to sahuaro, extensive forests of chollas characterize this desert shrub type. The heaviest stands, for the most part, consist of a single species, the jumping cholla *(Opuntia fulgida)*, a plant of the mesas and valleys, while the hottest desert hillsides are taken over by the teddy bear cactus *(O. Bigelovii)*. Fine forests of the former species are found on the plains adjacent to the Gila, particularly in the vicinity of Florence. In other areas various prickly pears are dominant, and in the higher elevations covered by the desert shrub type the large-jointed *O. Engelmannii* frequently is the important species; in other regions *O. phaeacantha* is most abundant. Other characteristic chollas of the paloverde belt are the vari-colored or staghorn cholla *(O. versicolor)*, *tesajo*, desert Christmas cactus or coyote cactus *(O. leptocaulis)*, the arborescent pencil cholla *(O. arbuscula)* and the long-jointed, dark-spined *O. acanthocarpa*. Some of the more typical woody members of the paloverde-cacti region, although not limited to this zone, are various squawberries *(Lycium* spp.), ocotillo *(Fouquieria splendens)*, which for example is absent or nearly so on the east side of the Baboquivari Mountains, and the white-spined cat-claw *(Acacia constricta)*.

[20] Hornaday, *Camp-Fires on Desert and Lava*, p. 68.

5: Castetter & Bell N-5 (1938-1940 1942
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As the paloverde-cacti type extends westward it can be regarded in general as gradually moving up from the foothill mesas and benches until confined to the higher and steeper parts of the range. As this shift occurs, *palo fierro* or ironwood *(Olneya tesota)* becomes the dominant tree in frost-free areas. This species is most abundant west of Ajo but very poorly represented in the eastern part of the region.

Desert grassland is by no means widespread throughout the area, being limited very largely to the southeastern portion of the Papago country. In the drainage washes which serve the desert grassland the prominent shrubs or trees are mesquite, cat-claw *(Acacia Greggii)*, desert hackberry *(Celtis pallida)*, lotebush, desert willow *(Chilopsis linearis)* and soapberry *(Sapindus Drummondii)*, which is found sparingly along the arroyos.

The chaparral zone is a rather limited one in our range of investigation, confined almost exclusively to the extreme eastern and southeastern portions, where with oak woodlands it occupies only higher elevations. In general the higher stretches of this chaparral belt support buckbrush *(Ceanothus Greggii)* and oak as the main species, while on the lowest, drier level adjoining the desert are thickets of *jojoba* or coffeeberry *(Simmondsia californica)*, with sumacs (*Rhus* spp.), *algerita (Berberis Fremontii)* and buckbrush in between.

As to the mountain areas, trees representative of the high mountains of southeastern Arizona are to be found on the Tumacácori Mountains, the westernmost wooded range in southern Arizona. The dominant trees of such mountains as the Baboquivaris and Tumacácoris are three species of oak—*Quercus oblongifolia*, common on the slopes and drier portions; *Q. arizonica;* and the sweet-acorn black oak *(Q. Emoryi)* which does best, however, in the valleys. On the Tumacácoris, oaks constitute orchard-like forests. Associated with these, although in small numbers, are the Mexican piñón

5: Castetter & Bell N-5 (1938-1940) 1942
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(Pinus cembroides) and the alligator-bark juniper *(J. pachyphloea)*. Pi Pa

Atop some of the higher mountains is to be found the western yellow pine *(Pinus ponderosa)*. It abounds in the Santa Catalinas and terminates its extreme southwestern Arizona distribution in the Baboquivaris. 137

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was on a lower technological level than that of the irrigated valleys of Sonora, these Indians were relatively good farmers. Despite the fact that they, particularly the Papago, cultivated small acreages, they did so intensively. The supreme Piman virtue was industry. The farmer arose before sunrise, worked without cessation until near noon and rested during the hottest part of the day, then continued work until dark. The heat prevented rapid labor, hence his toil was slow and plodding but unremitting.

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Utilization of Native Wild Plants

In the Papago region certain wild staple foods grew in abundance and were extensively utilized. Highly important among these were the fruits and seeds of sahuaro *(Carnegiea gigantea)*, and, in the southern part of Pimería Alta, organ-pipe cactus or pitajaya[67] *(Lemaireocereus Thurberi)*. Of such value was sahuaro that each family established a permanent camp in the nearest available cactus area; its significance is further indicated by the fact that sahuaro harvest marked the beginning of the new year in the calendars of both Papago and Pima. Kino noted the extensive use of pitajayas in the Indian diet in traveling among Papagos from the Gila River to La Concepción (Caborca), as well as in the vicinity of San Luis Bertrando where he observed that the numerous pitajayas lasted the Papago until December.[68]

Another very outstanding food was cholla buds, fruits and joints, and some informants regarded cholla buds of even more importance than sahuaro fruit. Buds of the abundant *Opuntia echinocarpa* and of the jumping cholla *(O. fulgida)*, gathered in May, and the fruit, which ripened in late summer, were pit-baked and constituted staple foods, while the fruit and sometimes buds and young joints of the vari-colored

[67] Pitajaya or pitaya here refers to the fruit of either or both *Carnegiea gigantea* and *Lemaireocereus Thurberi*; sahuaro invariably refers to *Carnegiea gigantea*.

[68] Bolton, *Kino*, I, 256.

5: Castetter & Bell N-5 (1938-1940 1942
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cholla *(O. versicolor)* and of the related *O. spinosior* were valued to some extent. The fruits, and to a lesser degree the joints, of prickly pear cacti of several species, especially *O. Engelmannii,* ranked high in the diet. That such fruit, known as tunas, was a staple food in Kino's day is indicated by his experience among the Papago near Santa Eulalia (in Sonora);[69] Anza,[70] three-quarters of a century later, observed that among the Papago at Quitobac, "*abrojos* which they scald, taking off the spines" were one of the usual foods. This was doubtless the fruit of a species of *Opuntia.*

Another Papago staple was the fruit and seed of mesquite *(Prosopis chilensis),* so plentiful in the interior valleys of the Papago country. Still to be found near all their watering places are the mortars in solid rock, known as "*pechita* holes," in which mesquite beans were ground. In this connection, Kino[71] noted that at Papago *rancherías* at Santa Viviana his party was given mesquite. Of somewhat less importance were the seeds of ironwood *(Olneya tesota)* which were ground and leached, those of Jerusalem thorn or horsebean *(Parkinsonia aculeata),* and paloverde *(Cercidium microphyllum).*

Staple root crops were the sand root *(Ammobroma sonorae),* often referred to as wild potato or wild sweet potato; *Franseria tenuifolia,* which grew on the flood plains near the villages, and to a lesser extent *Monolepis Nuttalliana.* Entire families went out with digging sticks to gather these several roots, and lived on them while they lasted. Bulbs of *covenas* or Papago blue bells *(Brodiaea capitata* var. *pauciflora)* were of less importance, usually eaten raw in early spring before other foods were available. Mange[72] wrote in 1694 that the food of Indians (doubtless Soba) at *rancheria* El Comac in Sonora was "some roots of wild sweet potatoes [probably sand root, at least in part], the pitaya in their sea-

[69] *Ibid.,* p. 244.
[70] Bolton, *Anza,* II, 22, 150.
[71] Bolton, *Kino,* II, 207.
[72] Mange, *op. cit.,* pp. 216, 225.

5: Castetter & Bell N-5 (1938-1940) 1942
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son and a red fruit which is given toward the sea." Also that the Papago south of Vacpia (in Sonora), who had never before seen Spaniards, sustained themselves with "roots or wild sweet potatoes," mesquite and other small fruits. He also makes mention of the importance of roots near La Luna Eddy, at Bacapa and at Basotucán (in Sonora).[73] Likewise Font[74] referred to sahuaro, pitaya, seeds of various grasses and various roots similar to the sweet potato *(camote)*, as well as *covenas* among the Papago. In 1912 Lumholtz[75] wrote that during March and April the Papago in certain areas formerly gathered in the large barren sand hills and lived almost exclusively on sand root, also that *covenas* furnished the Papago a favorite food supply.

Mescal *(Agave Palmeri, A. Schottii, A. deserti* and *A. americana)* was used to a fair degree by those Papagos who were within reasonable access of it or could obtain it by trade, but was more of a delicacy. It was to be found only in the higher mountains and not in abundance, and was often gathered along the Mexican border and pit-baked by parties who went to Sonora to labor. The fruit of *datil (Yucca baccata)* furnished variety to the diet and was always gathered in August by the men when available, but plants often failed to fruit. Yucca was obtainable on the plains of the Papago country only at the head of the Altar Valley.

Small greens utilized in their season were amaranth, pigweed or *bledo (Amaranthus Palmeri)*, lambsquarter *(Chenopodium* spp.) and saltbush *(Atriplex Wrightii)*. Cañaigre *(Rumex hymenosepalus)* was of less importance. These, particularly pigweed, were never dried and stored but while in season constituted the main, if not the only, article of diet.

Acorns were highly valued but neither common nor easily accessible. Wherever those of black oak *(Quercus Emoryi)* or *Q. oblongifolia* were available without too much effort, or

[73] *Ibid.*, pp. 183, 185, 186-87.
[74] Bolton, *Anza*, II, 320.
[75] Lumholtz, *New Trails*, pp. 318-19.

5: Castetter & Bell N-5 (1938-1940 1942
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could be secured by trade, they too constituted an interesting adjunct to the diet, and were eaten without leaching. These were found largely in the southern part of the Papago territory, as in the Baboquivari Mountains and the orchard-like forests of oak in the Tumacácori Mountains. Velarde[76] reported the important fruits of the land were tree cactus (evidently sahuaro and pitajaya), tunas, acorns and wild nuts.

The Papago formerly utilized to a fair extent the small seeds of several species of plants, but these largely have fallen into disuse. Most valued were tansy mustard *(Sophia pinnata)*, amaranth *(Amaranthus Palmeri)*, saltbush *(Atriplex* spp., especially *A. lentiformis)* and lambsquarter *(Chenopodium murale)*. Boxthorn *(Lycium Fremontii)*, gathered in early summer, was the most highly prized of the berries.

The Sand Papago, mentioned by Gifford,[77] and the most nomadic of the Papago, lived on wild foods supplemented by vegetables obtained from the Yuma in exchange for Gulf shells. Lumholtz[78] described them as depending chiefly upon the sand root, gathered the year round, and mentions a Sand Papago hermit who lived almost entirely on this root; they also extensively utilized chia *(Salvia chia)* as well as mesquite beans, in search of which they traveled as far as Quitobaquito, Santo Domingo and the lower Sonoita River. Also of considerable importance were sahuaro, pitajaya, *palo fierro* or ironwood, and a succulent plant of the sand dunes, *hierba salada (Oenothera trichocalyx)*, which was prepared by boiling. Díaz[79] noted in his diary (1774) that the Papago (doubtless Sand Papago) living in the sierras between El Carrizal and the Gila, in extreme southwestern Arizona, maintained themselves, so far as plant food was concerned, on mesquite, screwbean, pitayas, tunas, sahuaro and certain roots. Although the Sand Papago almost completely lacked agricul-

[76] Mange, *op. cit.*, p. 309; Wyllys, *Velarde's Relación*, p. 128.
[77] Gifford, *The Cocopa*, p. 262.
[78] Lumholtz, *op. cit.*, pp. 204, 330-33.
[79] Bolton, *op. cit.*, pp. 260-61, 263.

5: Castetter & Bell N-5 (1938-1940) 1942
NU28 Papago NU28
Pima NU29

ture, a single agricultural site is attributable to them at Suvuk, southeast of Tinajas de Emilia, in Pinacate. Here, by means of the planting stick, were sowed on a very small scale maize, beans and pumpkins. Once a year they journeyed to the Yuma and bartered baskets and sea shells for maize, teparies and pumpkins. Emory[80] observed that they subsisted principally on fish.

Pa 222 262 137

Our Pima informants agreed that the predominant ancient native food plant was mesquite, followed in order by sahuaro fruit and cholla buds. Garcés, in 1774, encountered Pimas from the village of Sutaquison, on the Gila, gathering sahuaro; and Font[81] a year later wrote of the Gila Pimas having an evil odor because of the mesquite flour, screwbeans and grass seed which they ate. In this same connection Bartlett[82] wrote, in 1854, that the Pima granaries were filled with mesquite beans and sahuaro fruit (in addition to wheat, corn, beans and pumpkins), and twenty years later Grossmann[83] noted the great importance of mesquite as a Pima food. Similarly Russell[84] found the most important, abundant and accessible Pima wild foods were mesquite and sahuaro; even in his day both were extensively utilized. This is supported by Whittemore's[85] statement in 1893: "The *principal* article of food was the bean of the mesquite, ..." which was gathered by large parties. Lloyd[86] also says that, up until shortly before 1903, mesquite beans and fruits of various cacti were staple articles of food. One informant, Manuel Lowe, insisted that cholla buds formerly constituted the most staple wild plant food. The jumping cholla *(O. fulgida)* was very plentiful on plains adjacent to the Gila and therefore easily accessible. However, *O. echinocarpa* thrived more in the hotter areas.

Pi 222 262 137

[80] Emory, *Report on the U. S. and Mexican Boundary Survey*, p. 123.
[81] Bolton, *op. cit.*, pp. 388; IV, 44.
[82] Bartlett, *op. cit.*, p. 264.
[83] Grossmann, *op. cit.*, p. 419.
[84] Russell, *op. cit.*, pp. 68, 71, 74.
[85] Whittemore, *op. cit.*, p. 54.
[86] Lloyd, *Au-au-tam Indian Nights*, pp. 123-24.

6: Densmore E-5 (1920) 1929NU28 Papago NU28

105 tion and it was the opinion that there was no mixture with Mexican or Spanish. The Government maintained four day schools on the reservation.

[114] The study of Papago music was begun at San Xavier, near Tucson, Ariz., in February, 1920. The Papago village is near San Xavier 177 Mission, which was established in 1692. At this mission the Franciscan Fathers minister to the Indians, who number about 700 in this locality. The Government agency was located here in 1915, but was moved two years later to Indian Oasis, now known as Sells, Ariz. The Papago at San Xavier live in adobe houses and still grind their own corn, but are adopting a general use of food supplies purchased in Tucson. (Pl. 2.) The country around San Xavier is desert with 133 mesquite and cactus. There are rugged hills and deep gorges cut by rivers that are raging floods at some seasons and "dry runs" at other seasons. The principal varieties of cactus are the saguaro or 137 giant cactus, and the cholla. (Pl. 3.)

764 On a hillside near San Xavier is an old burial place. (Pl. 4, *a*.) The burial spaces are formed by building a low stone parapet on the side of the hill and roofing it with heavy timbers thrust into the hillside. The bodies were placed in these spaces, or shelters, and all openings were closed with stones. After a suitable time the bodies were taken out and others were placed in the inclosure. There were compartments in these burial chambers and several bodies were placed in each compartment. They have not been used in recent times and some remain tightly closed, while in others it is possible to see parts of skeletons and fragments of various sorts. Plate 4, *b*, *c*, shows the same opening, one being at a distance and the other showing the interior, where a skull can be seen. Near it was a bone that appeared to be part of a leg or arm. Scattered about were bits of leather resembling parts of a saddle. This place is particularly sightly. It 133 faces the south, with a magnificent sweep of view. The mountains in Mexico can be seen at a distance of about 40 miles, while in the foreground is an expanse of desert. The old and new are strangely 177 mingled here, as it is in this desert that the Government is establishing (1921) an irrigation system by means of which the Indians will be able to irrigate their land.

114 A further study of Papago music was made in November and December, 1920, at Sells, more than 60 miles west of Tucson. Songs were also recorded at Vomari village, and information was obtained at Santa Rosa, the former being in the extreme southern and the latter in the extreme northern part of the reservation. The customs and songs differ somewhat in different localities, and numerous photographs were taken showing the geography of the country. Between 133 Sells and Vomari the country is more mountainous than in the vicinity of San Xavier, the most prominent mountain being Baboquivari

6: Densmore E-5 (1920)1929 NU28 Papago NU28

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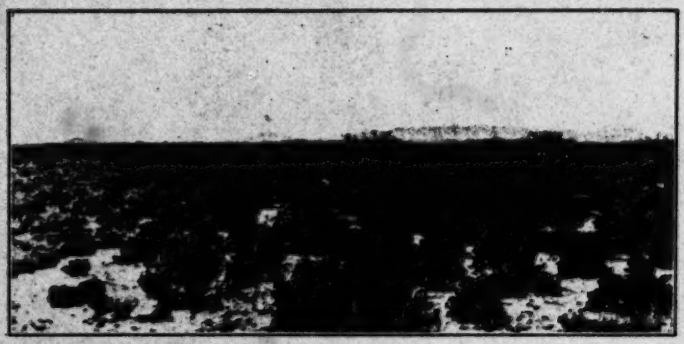
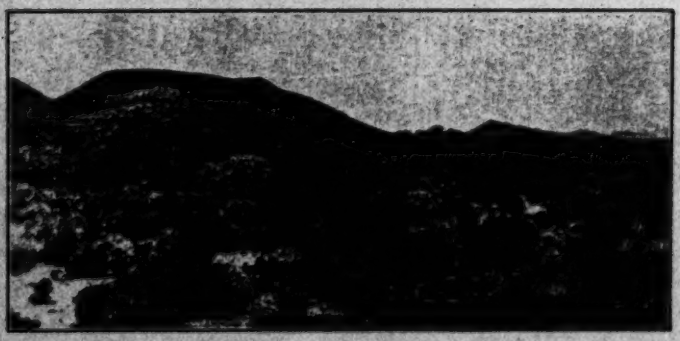


a, Desert near San Xavier

b, Hillside with saguaro cactus near San Xavier



c, Cholla cactus near San Xavier

6: Densmore E-5 (1920)1929 NU28 Papago NU28

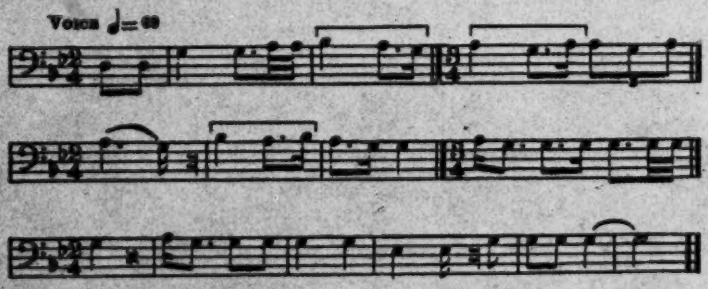
"Gray horned toad, earth flower they mixed. They gave it to me to drink intending to make me crazy." This song was not transcribed. 533X

The next two songs are "rattlesnake medicine songs," and were sung with the same degree of loudness as the Koŏp songs, while the horned-toad medicine songs were sung in a lower tone.

No. 55. "A Painted Snake Comes Out"

(Catalogue No. 1022)

Recorded by RAFAEL MENDEZ



TRANSLATION

Here we begin to talk.
We call a name toward the east and a snake comes out, nicely painted.

Analysis.—This song contains only four intervals larger than a whole tone, which is interesting in connection with the words. A similar song is No. 68. A certain correspondence has been noted between the structure of songs concerning animals and the motion of the animals.[12] The fourth has been found to characterize songs concerning birds, and particularly large intervals are found in the songs said to have been received from a horse (Nos. 58–61). The tonality of this song is minor and special emphasis is placed upon the tone above the keynote.

In the country of the Papago there lives a wasp that makes a small, straight hole in the sand. It digs its hole 4 or 5 inches downward, then the hole is turned at an angle. In the words of the following song a snake speaks to a wasp that is digging its hole in front of him and throwing the dust in his eyes. [137]

[12] Cf. Bull. 71, Bur. Amer. Ethn., p. [illegible].

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

132 few minutes later the Baboquivari Range, at a distance of ten miles, was enveloped in a light fog. The change was not only seen but felt, the temperature fell, and the moisture of the air was very perceptible. As the wagon was heavy and the road led uphill, it grew late before our arrival, but the moon was half full, so we found our way easily in the now quite chilly evening. The spell of extremely dry air was broken and the season of rain showers approaching.

We made our camp next to a big mezquite tree on a 756 slope among the ranches. The weird singing of a medicine-man sounded through the greater part of the night. Few are those Papagoes who have lost faith in their own doctors, and even the so-called policemen turn to them for relief if anything ails them.

361 Fresnal consists in reality of three rancherias, and we 132 found ourselves in the middle one. They are pleasantly situated among the foot-hills and look like villages. The [137] name is derived from some ash trees that grow in the arroyo, the native name having the same meaning. Naturally, the rainfall is greater here in the mountains than on the llano and, according to local accounts, the arroyos at times run a whole day. Occasionally the water is six feet deep. The Indians say that the arroyos here carry water to the Sonoita River.

231 The Indians of Fresnal are well-to-do; three or four of the men are reputed to own as many as two hundred head of cattle and fifty horses each. Wagons and good horses were seen, and there were plenty of chickens about. Men and women, especially the latter, looked in

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

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Peak of Baboquivari

Ocotillo (*Fouquieria splendens*)

Entrance to the sacred cave, at foot of peak of Baboquivari

Barrel cactus

[Facing p. 42]

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

CHAPTER IV

THE GIANT CACTUS OR SAHUARO—THE SAHUARO FEAST AT NORIA—DANCING AND SINGING—THE MEDICINE LODGE—TOBACCO—WELL RECEIVED—DISSERTATIONS WITH THE INDIANS—AN ADVENTURE—AN ANCIENT FESTIVAL—NATIVE ORATORY—OBJECTION TO PHOTOGRAPHY—ARTISTIC GIFTS OF A NATIVE

THE giant cactus (*Cereus giganteus*), or sahuaro, 137
which is the direct and indirect cause of such festivals as the one we were to witness, is by far the most noteworthy representative of plant life in the desert, being, in fact, one of the most remarkable plants on the globe. It reaches a height of forty to fifty feet, sometimes even more. At times the sahuaro appears as a single trunk, like a column, but more often branches of nearly the same thickness protrude from it, stretching upward arms lifted as in appeal. The evergreen trunk and branches have deep longitudinal furrows or flutes, armed with spines and wonderfully adapted for retaining moisture. Acting in a manner similar to that of the bellows of an accordion, these close together during drought and open again to receive moisture.

It avoids the great belt of sand dunes that stretches along the upper part of the Gulf of California, from Port Lobos westward, and ceases to appear south of the Gila Range and Sierra Blanca. Often a single column, the only one on a whole mountain, appears on top, resembling a sentinel on guard. At other times such a

7: Lumholtz N-5 (1909-1910)1912
NU28 Papago NU28

137 single column has found the means of existence on some terrace on the mountain side, reminding an imaginative traveller of the ruins of a temple in Greece. Along the mountains east and south of Sonoita, Sonora, this cactus attains its most luxuriant growth. Here as well as near other ranges impressive forests of these gigantic, singular structures of the plant dominion appear, calling to mind creations from the carboniferous period.

In May the tips of the trunks and branches produce a multitude of superb cream-white flowers. Toward the end of June the famous sahuaro fruit appears, the size and shape of a large hen's egg. A spiny skin which is easily removed protects the juicy, crimson, and fleshy substance in which numerous black seeds are imbedded. Although possessing not quite as much flavor as the related and more famous pitahaya fruit of Mexico, the sahuaro is a palatable relish in the excessively hot and dry climate, containing also, like the pitahaya, considerable nourishment.

The violent storms of the desert make no impression on the giant cactus. However, one wonders that it can exist at all, since the fruit and the plant itself prove in many ways such an attraction to animals. As soon as the sweet fruits ripen they are attacked by birds, while those that fall to the ground are eaten by hungry and thirsty animals, which prevent the seeds from germinating. The woodpeckers make large cavities in the juicy pulp of the trunk, the plant protecting itself by growing a hard tissue all around the cavity, in which various kinds of owls, falcons, and fly-catchers make their nests;

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

here also bees deposit their honey and bats make their 137
homes. Sometimes rabbits attack the stem to get at the
juicy pulp.

To the Indians the sahuaro is invaluable, and by 222
tacit understanding they consider it a crime to cut one
down. The grateful fruit comes at a time when most
needed, and the Indians leave their habitations to camp
among the sahuaro as long as the season lasts. Not only
does the fruit then furnish them with their principal
means of subsistence, but the greater part is boiled down [252
to a sirup for future consumption in the winter, serving 273]
also as material for an intoxicating drink, which is used
at the sahuaro festival. The seeds, too, are eaten after
having first been ground on the metate, and they taste
better than would be expected; the Indians also feed their
fowls with them and many sackfuls are brought back to
the houses after the sahuaro harvest. The wooden skele-
tons or ribs of the sahuaro furnish the Papago with light, [342]
strong, and elastic building stuff, and from the same ma-
terial he makes the long stick which is needed to bring
the fruit down from its lofty elevation, coloring the pole
red with the juice of the fruit. Also chicken coops, chairs, [322]
traps, and similar articles of the household are manufact-
ured from sahuaro ribs. Even the wooden tissue bags [415]
produced by the woodpeckers are made to serve as water
bottles or drinking vessels.

So important a part does this cactus play in the life [805]
of the Papago that their year begins with the sahuaro
harvest. The season lasts from the middle of June till 222
the middle of July. Every rancheria is supposed to make 796

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

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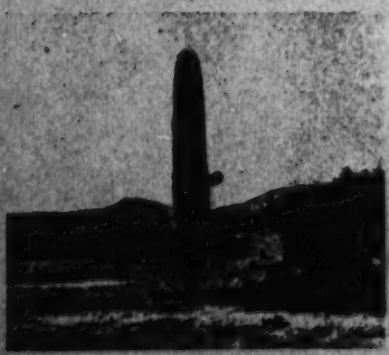
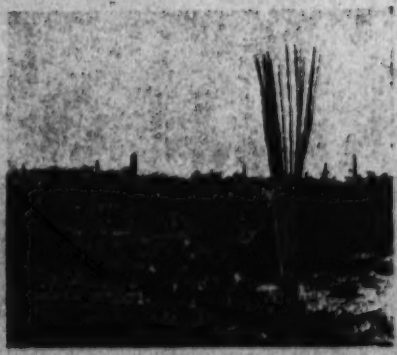
SAHUARO, OR GIANT CACTUS (*Cereus giganteus*)



SINGLE-COLUMN SAHUARO



SAHUARO, DRY, SHOWING ITS WOODEN STRUCTURE

[Facing p. 48]

7: Lumholtz N-5 (1909-1910)1912
NU28 Papago NU28

136 from eight to ten inches, not less than eight, distant from the animal. I did not notice whence the fluid came, but I observed that its left eye was bloody; in other ways it seemed normal, and had evidently not been maltreated by the dog, which feared its spines. On my return to civilization I find that the singular habit of ejecting blood from the eyes, peculiar to this animal, is known to the ranchmen of the region of its habitat, both Mexican and American, and that it also has been brought to the attention of men of science. It has been suggested that the habit is practised only during the time of the shedding of the skin.

231 The night spent at the next rancheria in the Baboquivari Range was disturbed by the constant, melancholy, low howling of a dog mourning the absence of the family. He was a very old dog, a black and white cur, with an honest-looking face. Usually Indian dogs have little reason for loving their masters, who show them small 133 consideration. After having visited a new Indian settlement called San Pedro, in the Roskruge Range, where there is excellent water in a well twenty-six feet deep, we continued our trip for six miles northward along the [137] western foot-hills. There are extensive sahuaro forests in this undulating country, which were unusually picturesque in the afternoon sun. We came across one or two camps of Indians who were gathering the much-relished fruit.

224 At dusk we met two young men on horseback returning from a shooting expedition, who presented us with half a deer tenderloin and some ribs. My aim was to

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

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PALO VERDE, NEAR A PAPAGO CEMETERY
Among its branches bundles of clothing for the departed

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THE MEDICINE-LODGE AT SANTA ROSA

[Facing p. 72]

7: Lumholtz N-5 (1909-1910)1912
NU28 Papago NU28

family had arrived, so we continued our journey toward the southern end of the Quijotoa Range.

136 In the evening mosquitoes and other insects gathered around the lantern and small brown beetles crawled inside of my trousers or through my hair, reminding me of tropical climates. Next morning, before starting, I had a refreshing bath in a small water-hole, while a butcher-bird (*lanius*) in a near-by bush sang with all his might, apparently enjoying the changed conditions as much as myself. This bird was often seen in the desert, often far from water. Although the thermometer registered as 132 high as 92° F. in the warmest part of the day, still the atmosphere, refreshed by the storms, felt remarkably cool, and the weather was cloudy.

133 The southern part of the somewhat extensive Quijotoa Range, separated from the rest, is called by the Papago, Kihotóak (*kíbo*, burden basket; *tóak*, mountain), said to be derived from its shape. The Spanish name of the whole range is a corruption of this native 622 name. I was glad to find Chief Alvina in his camp, which was in close proximity to great forests of sahuaro on the slopes along the eastern base of the mountains. [574] He brought me as a welcome some pitahaya fruit which tasted remarkably well. All the rest of the fruit gatherers had already left, for the sahuaro season was over, though [137] there were still to be found pitahayas, the other savory cactus fruit of the region. There was no pasture; our horses fed on rolled oats, besides relishing the leaves of the palo fierro (iron-wood) tree.

The chief was perfectly willing to be interviewed for

7: Lumholtz N-5 (1909-1910) 1912
NU28 Papago NU28

hours. He thought the number of the Papagoes was 622
decreasing. Few old men were seen any more. The food which is gradually supplanting their native dishes is injurious to the health of the Papago. Children were no longer obedient. The young men nowadays are seized with restlessness and want to leave for other parts of the country; nobody takes care of them, and they die early, he complained. We took a walk together, and he pointed out to me the ripe nuts of the *jójoba,* a bush of 137
common occurrence in that country. They are eaten by [242]
the Indians and have rather a pleasant flavor. As they contain a great deal of oil, they might compete with peanuts in the oil industry of the world, were it not for the slow growth of the bush. Mr. M. G. Levy, mine-owner
and store-keeper in Ajo, thinks that they will prove of importance as cattle food and that they should be cultivated. Among the frontier population the oil has great reputation as a hair restorer.

On two afternoons we had quite heavy showers, and [132]
I felt some regret at having disposed of my large, though inconvenient tent at Indian Oasis, taking with me only the fly. Pablo and I were drenched and so were our blankets. It would have been difficult to make a fire but for the presence of the small resinous bush called [137]
tovoso, which burned lustily in spite of being dripping wet. We tore the bushes up entire and kept up a bonfire by which we dried ourselves and cooked our food. I began to wonder whether this could truthfully be called a desert.

7: Lumholtz N-5 (1909-1910)1912
NU28 Papago NU28

000 seemed able to live here. The prevalent vegetation was,
137 as usual, greasewood with salt bushes now and then. Low sand dunes were visible here and there.

177 The Pimas of Kohatk I found to be good-tempered,
[302] affable people. The women cut their hair in front so as to have bangs and they are good-looking. These natives seem to be somewhat under Roman Catholic influence and have abandoned their native feasts. Photographing was as much detested here as elsewhere. The sight of
[774] my camera would make the children take to the woods and the old men hurriedly disappear on hands and knees into their dome-shaped huts.

[191 177] I heard neither English nor Spanish spoken, but the inhabitants have adopted the frontier man's way of living, frying their meat in lard and adding quantities of it to their beans. They buy white flour and make unwhole-
[262] some tortillas in boiling lard. This heavy, poorly cooked food forms their daily regime, without any variety. A small bucketful of coffee is distributed at meal-time both
[231] in the middle of the day and in the evening. They possess cattle but, like most white ranchers, are too lazy to milk the cows. The meals are appropriately served on plates of cheap crockery and cups bought in the white
[146] man's stores. The participants give audible evidence of consuming more lard than is good for them, and, were the facts known, "to be as dyspeptic as a civilized Indian" would be an adage. Think of the anomaly of leaving wholesome, natural, well-cooked dishes for a diet of lard and the cheapest kinds of canned goods.

252 Contrary to the universally accepted opinion, the cui-
[i.e., in the country between Anekam and Kohatk.-An.]

13:Davis E-5 (1920) 1920 NU28 Papago NU28

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grimage and ceremony may entail floods, drought, sickness, even death. To avoid these the people travel many miles, with teams or on horseback, under a blazing sun or in rainstorms, to participate in the cere-
133 mony. The place where the monster lived covers an area of two or three hundred acres of whitish earth or calcareous material, which the Indians claim to be the remains of the flesh of the monster. Below the surface
137 are massses of immense bones. Quitova-
342 quita is surrounded by tropical desert vege-
361 tation of palo verde, mesquite, palo fierro, giant or saguaro cactus, pitahaya or organ cactus, and other desert growth. It consists of twenty or thirty one-story houses, built of adobe or of stone imbedded in mud.

312
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In the center of the village is a *charco*, or large pool, which is fed by a number of springs and furnishes water for the village, and drinking and wading places for burros, horses, and cattle. When the pool is filled, the water is used to irrigate the gardens of the villages. During the period of the fiesta the village is thronged with visiting Indians, and those who cannot find accommoda-

134 **Soils and Minerals.** The greatest portion of the Papago Reservation is composed of alluvium weathered from the scattered hills and mountains, and which grades from coarse to fine as distance increases from the source. In the valley floors the soil varies from fine sand to sandy clay and clay, all suitable for agriculture where water is available.

135 Although in the latter part of the nineteenth century mining brought large numbers of people to the Papago country and several sizable settlements flourished for brief periods, mineral resources have not yet been discovered which would be suitable for large-scale, long-term development. No oil or gas has been found, and promising formations are absent. Highly mineralized formations, mainly Pre-Cambrian and Mesozoic, have produced limited amounts of gold, silver, lead and manganese. Workable copper deposits exist close to and on the San Xavier Reservation, and are being mined on a large scale.

137 **Climate.** The Sonoran Desert, in which the Papago country lies, is part of a series of deserts occupying about 440,000 square miles in the southwestern U. S. and northwestern Mexico. It is desert in both the colloquial and technical senses, with potential evaporation 8 to 10 times greater than rainfall. Although long records of rainfall, 132 temperature, and other details of weather are scanty for the 127 Papago Reservation, recent records can be used in conjunction

137

Flora and Fauna. In a few bottom lands along the larger streams there were formerly dense stands of mesquite, the trees reaching heights of 30 to 40 feet. Remnants of these survive, and scattered mesquite trees occur throughout the reservation. The extent to which mesquite has invaded the grass lands is a subject of dispute among botanists and ecologists, but there is no doubt that in many parts of the deserts of the Southwest formerly lush stands of grass have been partly replaced by mesquite, cactus, and various shrubs.

Most of the Papago Indian Reservation is within the area of two major vegetation patterns -- at higher elevations and on rougher terrain, the dominant plants being paloverde, bur sage, and cacti, and at lower elevations creosotebush and desert saltbush. These and many less conspicuous plants are highly adapted to desert conditions. Many parts of the reservation typify what has been referred to as the "giant cactus forest" -- the saguaro towering above dense stands of paloverde, shrubs, and cacti.

"The desert land grass cover is made up of a perplexing number of species, very many of which are excellent range-grasses" (A. A. Nichol, the Natural Vegetation of Arizona, p. 198.) Aside from overgrazing, increased

aridity, and the replacement of grass by mesquite, shrubs, and cactus, the distribution and abundance of grass is closely controlled by precipitation, with most of the growth taking place each year in August. In general, the best grassland is at the higher elevations of the reservation (excepting the rougher summits of the mountains and ridges), that is, on the slopes of the Baboquivari Mountains and in other scattered locations where precipitation is favorable. In this connection it is of interest that Richard J. Hinton described the country for 38 miles west of the Baboquivari Mountains as "fine grazing land" in 1878 (The Handbook to Arizona), whereas the grass got progressively poorer as he travelled further west. 137 ●

A large number of the common desert plants were traditionally used by the Papago, particularly as food, and also as the materials of which houses, baskets, and numerous tools and utensils were constructed. Particularly important were the fruits of the sahuaro and mesquite and seeds of sacaton grass, and pigweed or amaranth. From spring through late summer, many plants were valued as greens, contributing importantly to the diet: lambsquarter, camigre, the buds of the cholla, the mescal or century plant, sotol, and others. 824 222 [262]

433 flooding and grasshoppers is won. This subsistence
24 scale, risky enterprise cannot long compete against
[461] the surplus-over-subsistence earned in the cotton fields.

The crops Desert People working in the 1950 cotton harvest did plant on the reserves were not even on a subsistence scale. The few beans or squash, the patch of melons they actually planted were no more than a supplement at most.

464 Clearly an important reason Papagos sell their la-
471 bor is that a high proportion do not even have flood
423 farms where they could try to farm if they wished to. Probably nearly half the Desert People picking cotton in 1950 had no fields.[1]

233 For Papagos who cannot farm, there is still a
433 possibility of raising cattle. However, xerophytic
[137] desert vegetation is not particularly well suited to fattening cattle--thorns don't make fat. Rainfall on
[132] reserve lands is very scanty, and good stands of grass are small and undependable.

231 Among Papago cotton pickers of 1950, nearly half
422 the families owned cattle.[2] However, some of them actually had only 1 cow, and the average number of head owned by each family was only a dozen.[3]

One difficulty for Papago cattlemen is that horses are kept by most families, taking up range that could support more beef animals. These horses are not especially good stock--no one raises horses for export.
[492] But the Desert People are still mainly in the pre-
[493] automotive age of transportation. If they don't walk, they generally must ride horseback or in a wagon pulled by horses. Over three-fourths of Papago cotton pickers in 1950 owned horses.[4] And each of these families kept
[621] 6 or 7 horses.[5] If it were not for an ordinance of the
[646] Papago Tribal Council restricting each family to not more than 10 head of horses, horse population of the reserved lands would undoubtedly be much higher.

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[1] 130 families gave information. 80 had their own fields, or 61%. (Only 2 were in irrigated projects, 5%) Fathers of 3 younger men had flood fields, 8%. So 41% had no flood fields in their extended family.
[2] 19 families of 40 questions owned cattle, 47½%.
[3] 8 families giving information owned 96 head, averaging 12 per family.
[4] 31 families of 40 questioned owned horses, 77½%.
[5] 21 families giving data owned 136, averaging 6.6 each.

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[133]
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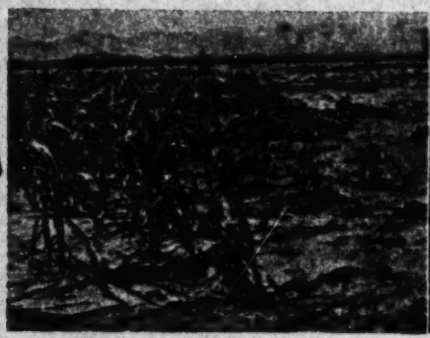
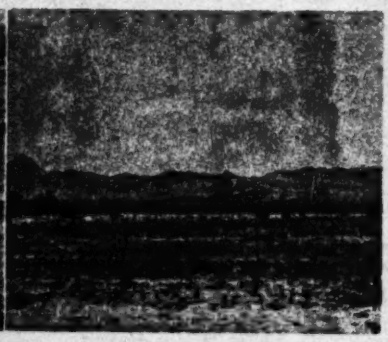


The corn-bean-squash fields are eroding and were always a gamble . . .



wheat stands are thin . . . and often don't ripen . . .

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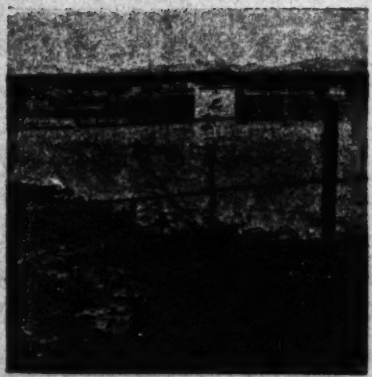
• 137



the range is barren . . .

so cattle graze on cactus.

133 PHYSICAL CHARACTERISTICS OF THE REGION.—The territory covered by the Papagos in their migrations, and
134 in which their villages are located, consists of mountain ranges and the intervening valleys. The soil of the valleys contains a considerable proportion of clay, so that it is all called adobe soil. In the mesas or plains occasional strips of sand occur. Along the arroyos, or dry water channels, deposits of gravel are numerous. The arroyos become raging torrents during the rainy season, rendering travel impossible or dangerous during the temporary flood. The soil of the foothills is very rocky. Alkali is present in the soil in varying proportions, giving the characteristic name to the vast stretch of country known as the alkali desert. It is not the presence of alkali, however, that makes the desert, but the absence of water. An abundant water supply renders this alkali soil equal in fertility to any soil in the country. As it is, the valleys contain a great deal of arable land,
137 which is evident from the great areas covered with grass, which form the stock ranges, and from occasional sections where weeds grow so luxuriantly after the rainy season as to overtop a man on horseback. Some portions of the valleys are covered with mesquite trees and bushes, and also sagebrush, but these sections produce abundant crops when irrigated.

132 CLIMATE.—The climate is very mild, being neither extremely cold in winter nor hot in summer. The mean average temperature during the summer of 1889 was 81.5°, and during the winter of 1889–1890 it was 52.6°.

312 WATER SUPPLY.—There are occasional wells found among the Indian villages. Natural water holes are quite numerous, and by raising embankments of earth in favorable localities the Papagos make huge ponds or reservoirs, which they call tanks. These natural and artificial reservoirs are only serviceable for the temporary storage of water, and toward the last they become filthy mudholes. The Indians, however, continue to use the water as long as it can possibly be considered a fluid. In one place the Papagos have dug a well 60 feet deep, and with incredible labor have made a footpath from the top of the ground to the level of the water.

Water is found by boring at a depth of from 200 to 600 feet, but no flowing wells have yet been obtained in the territory. The water in the wells rises from 50 to 150 feet, and then is raised to the surface by steam pumps. The Indians, however, have not the financial resources with which to sink or operate artesian wells. When their tanks are exhausted they remove with droves and herds to the valleys and canyons in the mountains, frequently crossing over into Mexico.

137 TIMBER.—The varieties of timber within the Papago range are the willow, cottonwood, mesquite, polleverda, and on the southern and western mountain slopes the oak. The mesquite is the most common timber, as it grows freely on the mesas. It rivals the hickory as firewood, throwing out great heat, and the coals retain fire even longer than coals of hickory. The mesquite, however, is very easy to cut, and is handled with far less labor than hickory.

137 FRUITS AND NUTS.—The sahuaro (giant cactus), which grows on the rocky soil of the foothills and covers the moderate mountain ranges, rises in height from 10 to 60 feet, and is a mass of vegetable matter, supported by an internal skeleton of ribs or poles of woody fiber. The fruit of this remarkable plant grows out of the top of the trunk and arms, and constitutes an important article of food, the Papagos almost living upon it during June, July,
272 and a part of August. They gather it with long poles, and eat it either fresh or after it has been dried. They make
262 from the juice a sirup and a drink which is slightly charged with alcohol. Although the ribs of the sahuaro are
[273] very valuable, the Indians never destroy the plant, and are greatly incensed if a white man cuts one down; but when the cactus dies and the vegetable matter dries, powders, and falls away, leaving the ribs exposed and bare,
[313] they are used as supports for the dirt roofs of adobe houses, for the sides of houses when plastered with mud, for poultry and pigeon houses, and other small structures.

262 The Papagos eat the fruit of the prickly pear cactus and make a sirup from its juice; from the mescal (sweet
[273] aloe) a highly intoxicating drink is made. The root, which is bulbous, grows partly under and partly above the ground, and when roasted it is very delicious, and great quantities are consumed by the Papagos. They dig out of the ground a vegetable which appears to be a species of wild onion, but they call it a groundnut, and relish it
[338] highly when boiled. A very useful plant found in large quantities, called the soap plant (amole), forms a substitute for soap.

282 The tannin root, resembling the sweet potato in appearance, grows in great profusion. It contains a large portion of tannic acid, and is a substitute for the astringent barks, hemlock and oak, which are used in tanneries.

262 FOOD.—In addition to the fruits, nuts, and fleah already mentioned, their food consists of wheat flour (usually
252 formed by the women on a metate) prepared in simple ways, parched wheat and corn, boiled wheat and corn, flour made from the mesquite bean, beans, boiled squash, green and dried squash seeds, beef, and poultry.

181 INDUSTRY.—The Papagos seem to be esteemed by the whites in general as the best Indians in the territory.
[464] They are industrious, and are good help in mines, on ranches, in the harvest field, and on stock ranges. They easily learn the mechanical arts, and set and handle mining drills as well as white men. The engineer at the Quijotoa mines said that his assistant was a Papago, and that he was fully competent to run the engine.

[312] In practical irrigation the Indians are conceded to be the superiors of the whites, and in their domain this is the foundation of agricultural skill. When properly educated there can be no doubt of their ability to acquire the scientific principles of the art.